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New host and distribution record of *Pontobdella macrothela* (Schmarda, 1861) (Annelida, Hirudinea) from a Grey Reef Shark, *Carcharhinus amblyrhynchos* (Bleeker, 1856), in Mozambique, Western Indian Ocean

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Abstract

This report describes the first record of the piscicolid leech *Pontobdella macrothela* from Mozambique waters and the first record of *P. macrothela* parasitizing a Grey Reef Shark (*Carcharhinus amblyrhynchos*). The leech, *P. macrothela,* was found attached externally between the third and fourth gill slits of a shark captured off Vamizi Island, Quirimbas Archipelago, northern Mozambique.

Key words

Elasmobranch, Hirudinida, host-parasite interactions, marine leech, Piscolidae, shark parasite.

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Introduction

The marine leeches of the family Piscicolidae are the only annelids known to parasitize elasmobranchs (Caira and Healy 2004). There are 23 known species of piscicolid leeches adapted to feed on the high-urea content of elasmobranchs, all of which are proboscis-bearing ectoparasites that inhabit exterior sites of their hosts such as fins and claspers as well as orifices such as the mouth (Llewellyn 1966, Caira and Healy 2004, Kvist et al. 2016). *Pontobdella macrothela* (Schmarda, 1861) has a widespread distribution in the warm waters of the Atlantic, Pacific and Indian Oceans (Sawyer et al. 1975, Burreson and Passarelli 2015) with at least 20 known elasmobranch hosts (Caira and Healy 2004, Yamauchi et al. 2008, Pollerspöck and Straube 2015, Daly et al. 2019). Nonetheless, the full range of geographical extent and elasmobranch host species of *P. macrothela* remain unknown. Moreover, current knowledge on *P. macrothela* is almost exclusively from studies conducted in

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Figure 1. *Pontobdella macrothela* removed from a *Carcharhinus amblyrhynchos* host and photographed after preservation in alcohol. Note the distinctive eye spots present on dorsal view in **A**.

the Atlantic and Pacific Oceans with a paucity of information on the distribution of this species in the Indian Ocean (Sanjeeva 1974, Daly et al. 2019).

The purpose of this paper is to report the first host record of the Grey Reef Shark, *Carcharhinus amblyrhynchos* (Bleeker, 1856), for the marine leech *P. macrothela*, the first record of *P. macrothela* from Mozambican waters, and one of few records of *P. macrothela* in the Western Indian Ocean.

Methods

A single specimen of *Pontobdella macrothela* was collected off Vamizi Island within the Quirimbas Archipelago in northern Mozambique (11°06.070′ S, 040°43.419′ E). Between 1 Sept and 10 September 2018, 6 *Carcharhinus amblyrhynchos* were captured and released for research purposes using single baited drop lines. On 1 September 2018, a piscicolid leech was found externally attached between the second and third gill slits on the right side of a mature (173 cm TL) female shark. The leech was manually removed and preserved in 90% ethanol and deposited temporarily at the Vamizi Marine Conservation Research Centre on Vamizi Island, Mozambique before being officially logged and deposited at the Faculty of Natural Sciences, University Lúrio, Bairro de Marrere, R. nr. 4250, Km 2.3, Nampula, Mozambique. Research was conducted under permit number 2/FCN/2018/GPIE.

The leech specimen was examined and later photographed using a Canon 1Dx MarkII with a 100 mm macro lens. The species was identified as *P. macrothela* using the key by Sawyer et al. (1975). Additional literature consulted for identification included Furiness et al. (2007) and Burreson and Passarelli (2015).

Results

Pontobdella macrothela (Schmarda, 1861)

Stibarobdella macrothela (Schmarda, 1861), see Burreson and Passarelli 2015.

New record. Mozambique: Cabo Delgado Province: Vamizi Island (11°06.070′ S, 040°43.419′ E, Ryan Daly coll., 1 September 2018 (1 specimen, Faculty of Natural Sciences, University Lúrio, Mozambique).

The specimen was sampled from skin between the second and third gill slits on the right side of a mature (173 cm TL) female grey reef shark (*C. amblyrhynchos*). After preservation the specimen measured 23 mm long and 5 mm at its widest point.

Identification. The specimen was brown in color and had characteristic large, rounded wart-like tubercles on the tegument. Importantly, the specimen had an unmistakable large caudal sucker of 2–3 times the size of the oral sucker, and large circular eyespots on the oral sucker

as described in the dichotomous key by Sawyer et al. (1975) and further detailed by Burreson and Passarelli (2015) (Fig. 1a, b).

Discussion

Parasitism represents a fundamental biological relationship that underpins one of the most common consumer strategies on the planet (Marcogliese 2004, Dobson et al. 2008). Parasites provide ecosystem goods and services; for example, some intestinal helminths potentially remove significant amounts of heavy metals from their hosts' tissues through bioaccumulation or maintain baseline ecological dynamics, roles that are often overlooked and yet many species of parasite are thought to be threatened or nearing extinction (Gómez and Nichols 2013). As such, information that adds to the limited knowledge of parasitic species, their range and hosts is important and relevant for conservation management. In particular, little is known on the life history of piscicolid species; however, an increasing interest in piscicolid phylogenetics and anticoagulants have greatly added to the knowledge of marine leeches (Utevsky et al. 2004, 2007, Williams and Burreson 2006, Kvist et al. 2016, Tessler et al. 2018).

Based on descriptions by Sawyer et al. (1975) and Burreson and Passarelli (2015) our specimen corresponds with the morphological descriptions of *P. macrothela*. This new record of *P. macrothela* from Mozambique contributes to the known range of this marine leech species by confirming its range along the coast of East Africa. The only other records of *P. macrothela* along the eastern African continent occur from Durban, South Africa and Malindi, Kenya, approximately 2317 km to the south and 870 km to the north, respectively (Moore 1958, Llewellyn 1966). The next closest record of *P. macrothela* in the Indian Ocean is approximately 1524 km to the west from D'Arros Island, Seychelles (Daly et al. 2019).

The widespread distribution of *P. macrothela*, which this report adds to, is frequently attributed to oceanic elasmobranch hosts (Sawyer et al. 1975, Burreson and Passarelli 2015). However, many reported *P. macrothela* hosts are associated with coastal environments and typically exhibit restricted coastal movements (Yamauchi et al. 2008, Wunderlich et al. 2011). Specifically, host records in the Indian Ocean of the Bowmouth Guitarfish (*Rhina ancylostoma* Bloch & Schneider, 1801), Zebra Shark (*Stegostoma fasciatum* (Hermann, 1783)) and Sicklefin Lemon Shark (*Negaprion acutidens* (Rüppell, 1837)) are not regarded as oceanic (Ebert et al. 2013). As such, further research into the genetic variation of piscicolid leeches is required to determine whether there is a single worldwide species or species complexes.

The leech attachment site on the host was similar to previously described attachment sites of *P. macrothela*; on the skin or within the buccal cavity of their hosts (Yamauchi et al. 2008, Caira et al. 2012). The number of elasmobranch-feeding piscicolid leeches present on a host may vary widely. There exist reports of 33 leeches on a Round Ribbontail Ray (*Taeniura meyeni* (Müller & Henle, 1841)) and 10 leeches on a Nurse Shark (*Ginglymostoma cirratum* (Bonnaterre, 1788)), but typically reports comprise no more than 1 or 2 leeches per host (Williams 1982, Yamauchi et al. 2008). That being so, it is possible that behavioural and environmental factors affect infection rates. Active and strong-swimming hosts such as *C. amblyrhynchos* reported here, along with Silky Sharks (*Carcharhinus falciformis* (Müller & Henle, 1839)), Blacktip Sharks (*Carcharhinus limbatus* (Müller & Henle, 1839)) and Tiger Sharks (*Galeocerdo cuvier* Péron & Lesueur, 1822) tend to have fewer reported leech infection sites (Yamauchi et al. 2008). In contrast, reports of heavier infection rates come from host species such as *T. meyeni*, *G. cirratum* and recently reported *N. acutidens* are comparatively more sluggish with long periods of inactivity and/or are found in lagoon or sheltered habitats. It is possible that the latter of these behaviours or environmental factors facilitates the dispersal and attachment of *P. macrothela* at higher rates, but this will require further study.

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Authors' Contributions

IS and NEH conceived the original study. RD collected the specimen. DO, IS, TH, MZ and NEH contributed to the data collection. RD took photographs of the specimen. IS logged the sample. CAKD wrote the manuscript with support from RD, DO, NEH and TH. All authors discussed the results and contributed to the final manuscript.

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